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(54) **PRIORITISING EVENT PROCESSING BASED ON SYSTEM WORKLOAD**

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G06F 13/00	(2006.01)
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CPC ***G06Q 10/06312*** (2013.01)

(58) **Field of Classification Search**

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USPC 719/313
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2007/0260470 A1* 11/2007 Bornhoevd G06Q 10/08 709/203
2009/0006320 A1 1/2009 Ding et al.
(Continued)

FOREIGN PATENT DOCUMENTS

EP 2487868 A1 8/2012

OTHER PUBLICATIONS

Search Report under Section 17 from the United Kingdom Intellectual Property Office, Nov. 18, 2013, 1 page.*
(Continued)

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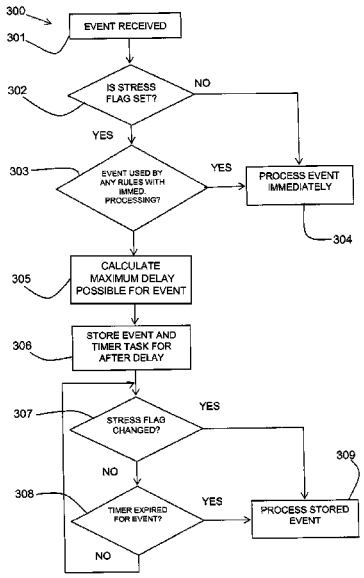
(57) **ABSTRACT**

Event processing is prioritized based on system workload. A time constraint attribute is defined in an event rule. The event rule uses one or more events. An event processing system is monitored to determine when the system is under a predefined level of stress. If the system is determined to be under the predefined level of stress, the time constraint attribute in the event rule is used to establish when the processing of a received event used in an event rule must be carried out.

19 Claims, 3 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

2009/0070786	A1	3/2009	Alves et al.	
2011/0093866	A1	4/2011	Grabs et al.	
2011/0196774	A1*	8/2011	Scianna	G06Q 40/06 705/37
2012/0084317	A1	4/2012	Sakamoto	
2012/0110599	A1*	5/2012	Schoning	719/318
2012/0124082	A1	5/2012	Crocker et al.	
2012/0278293	A1*	11/2012	Bulkowski et al.	707/703

OTHER PUBLICATIONS

Fodor et al., "Results on Out-of-Order Event Processing," Practical Aspects of Declarative Languages, Lecture Notes in Computer Science vol. 6539, Jan. 2011, pp. 220-234.

Magid et al., "Application Generation Framework for Real-Time Complex Event Processing," Proceedings of the 32nd Annual IEEE International Computer Software and Applications Conference (COMPSAC'08), Jul. 2008, pp. 1162-1167.

* cited by examiner

FIG. 1

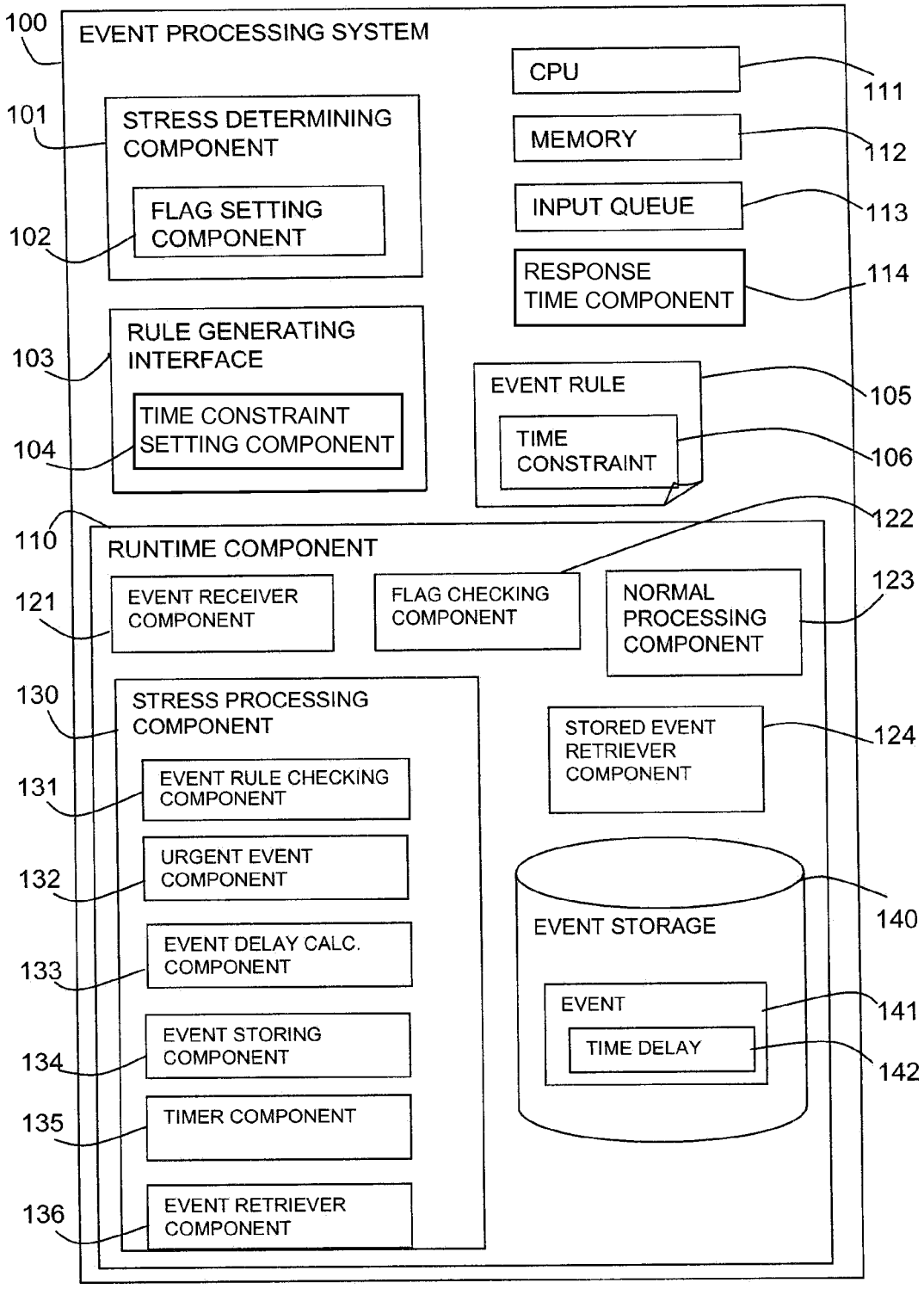

100
EVENT PROCESSING SYSTEM
CPU
111
101
STRESS DETERMINING COMPONENT
MEMORY
112
FLAG SETTING COMPONENT
102
INPUT QUEUE
113
RESPONSE TIME COMPONENT
114
RULE GENERATING INTERFACE
103
EVENT RULE
105
TIME CONSTRAINT SETTING COMPONENT
104
TIME CONSTRAINT
106
110
RUNTIME COMPONENT
122
EVENT RECEIVER COMPONENT
121
FLAG CHECKING COMPONENT
NORMAL PROCESSING COMPONENT
123
130
STRESS PROCESSING COMPONENT
STORED EVENT RETRIEVER COMPONENT
124
EVENT RULE CHECKING COMPONENT
131
URGENT EVENT COMPONENT
132
EVENT STORAGE
140
EVENT DELAY CALC. COMPONENT
133
EVENT
141
EVENT STORING COMPONENT
134
TIME DELAY
142
TIMER COMPONENT
135
EVENT RETRIEVER COMPONENT
136

FIG. 2

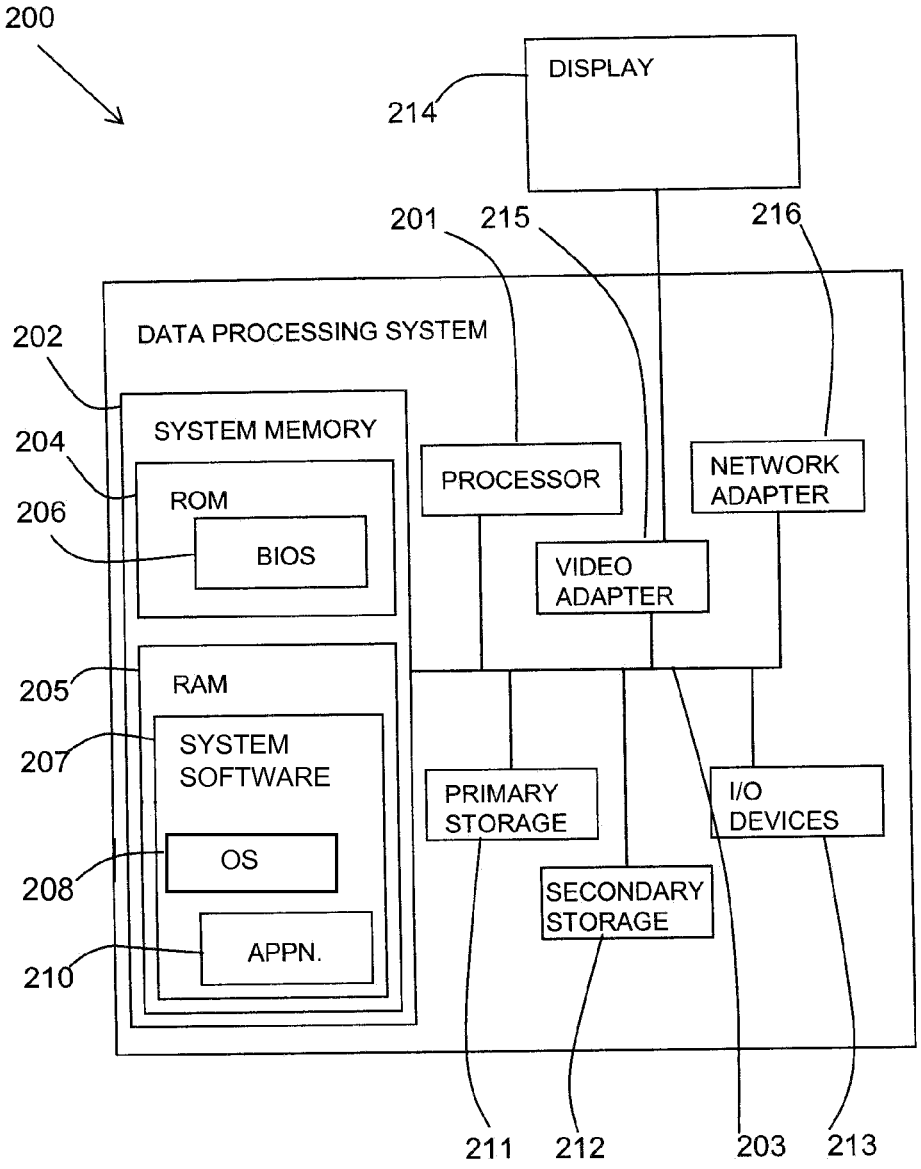
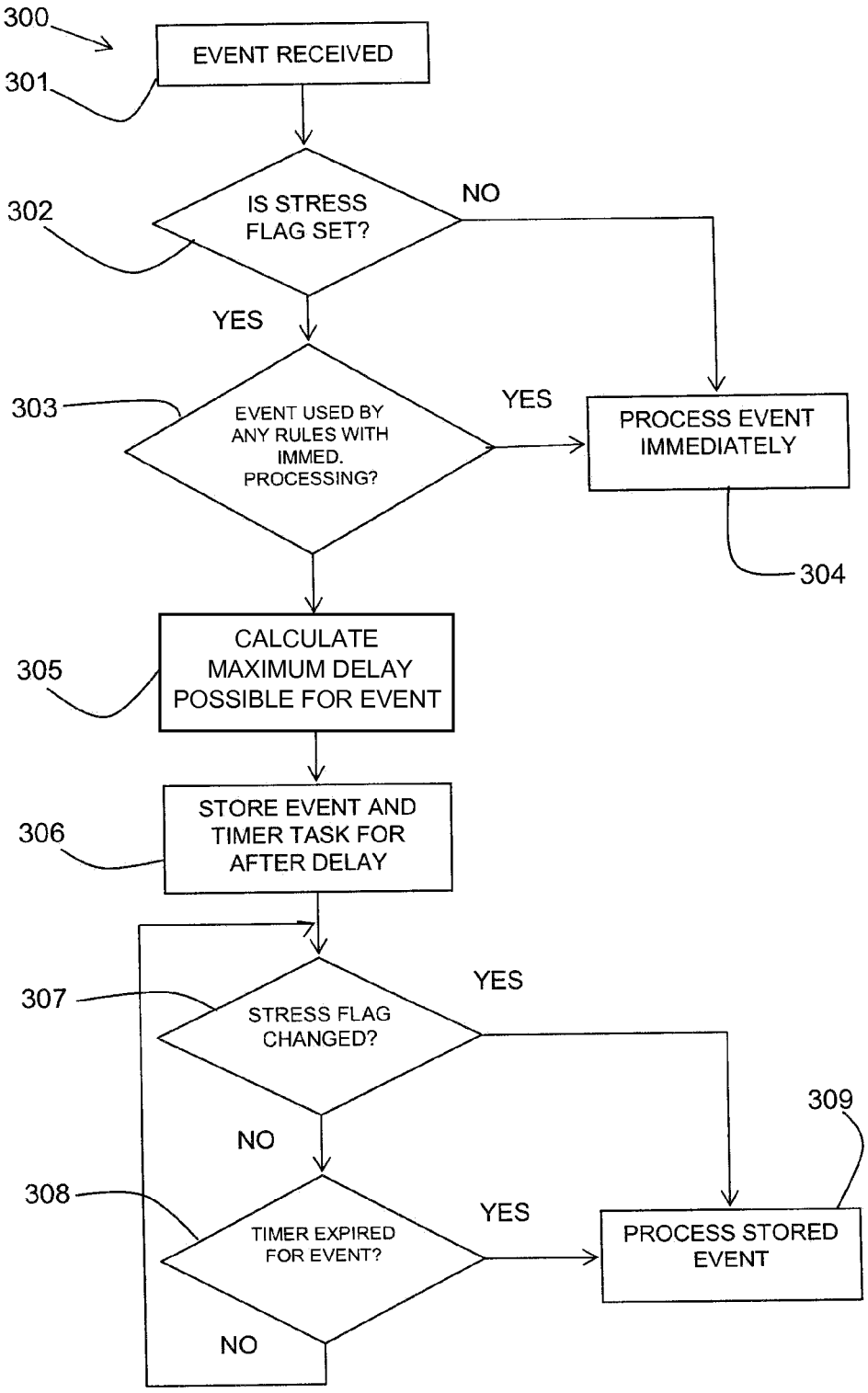

200
DISPLAY
214
201
215
216
DATA PROCESSING SYSTEM
202
SYSTEM MEMORY
204
ROM
206
BIOS
PROCESSOR
NETWORK ADAPTER
VIDEO ADAPTER
205
RAM
207
SYSTEM SOFTWARE
OS
208
APPN.
210
PRIMARY STORAGE
SECONDARY STORAGE
I/O DEVICES
211
212
203
213

FIG. 3


300
EVENT RECEIVED
301
IS STRESS FLAG SET?
302
NO
YES
EVENT USED BY ANY RULES WITH IMMED. PROCESSING?
303
YES
PROCESS EVENT IMMEDIATELY
304
CALCULATE MAXIMUM DELAY POSSIBLE FOR EVENT
305
STORE EVENT AND TIMER TASK FOR AFTER DELAY
306
STRESS FLAG CHANGED?
307
YES
NO
TIMER EXPIRED FOR EVENT?
308
YES
NO
PROCESS STORED EVENT
309

PRIORITISING EVENT PROCESSING BASED ON SYSTEM WORKLOAD

This Application claims the benefit of priority to United Kingdom Patent Application Serial No. GB 1310378.3, filed on Jun. 11, 2013, the contents of which are hereby incorporated by reference.

FIELD OF INVENTION

This invention relates to the field of event processing. In particular, the invention relates to prioritising event processing based on system workload.

BACKGROUND OF INVENTION

In a complex event processing system, there can be a wide variety of events and rules to act upon those events deployed in a central processing system. These types of system can also experience heavy loads of tens of thousands of events per second. The number of events being sent to the system may also vary significantly over time, where at certain periods of the day there could be thousands of events per second arriving, whereas at other times there could be several hours where no events are received. In order to handle such workloads there are two traditional approaches.

The first approach is to size the system so that it is able to process at the expected peak rate. This can add considerable expense to the solution, as software is typically charged per number of processors. For example, if 12 cores are required to handle a peak load that lasts for one hour per day, and only one core is needed to handle the load for the other 3 hours, the client would be paying for all 12 cores.

The second approach is to size for a lower rate, and allow messages to build up on input queue. If the system does not have sufficient processing power to handle the input rate, then events will typically build up on the input queue assuming an asynchronous messaging event processing system.

Events building up on the input queue can have several drawbacks:

1) If a large number of messages build up on the input queue then it can slow down the processing of events that may be time sensitive, for example, certain types of event may need to be processed within seconds of arriving. Message priorities could be used to mitigate this problem, which should allow higher priority events to be processed first, but this relies on the message producer to set the priority, whereas it would typically be the business user that is defining the event processing logic that would understand which events are higher priority, and as new logic is added priorities could change, which would be difficult to distribute to all message producers.

2) Handling a large number of messages on a queue can add significant load to the messaging system, particularly if messages have different priorities, so this could slow the system down even more when it is under load.

Therefore, there is a need in the art to address the aforementioned problems.

BRIEF SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided a method for prioritising event processing based on system workload, comprising: defining a time constraint attribute in an event rule, wherein the event rule uses one or more events; monitoring an event processing system to determine when the system is under a predefined level of stress; and if the system is determined to be under the predefined level of stress, establishing when the processing of a received event used in an event rule must be carried out using the time constraint attribute in the event rule.

Establishing when the processing of a received event used in an event rule must be carried out may include processing the event immediately if the time constraint attribute indicates immediate action; or processing the event after a predetermined amount of time as defined by the time constraint attribute.

Establishing when the processing of a received event used in an event rule must be carried out may include calculating the maximum delay for an event based on the time constraints of one or more event rules in which the event is used; and storing the event with a timer task for processing the event after the maximum delay.

Processing a stored event after the maximum delay may have priority over newly received events.

The method may include determining that the system is no longer under the predefined level of stress; and processing any stored events in the order of their stored time delay.

The method may include setting a flag if the system is determined to be under a predefined level of stress; and checking the flag when receiving an event at the event processing system.

Defining a time constraint attribute in an event rule may be defined in an option in a business user interface of an event processing system.

Monitoring an event processing system may monitor components of the system and determine if predefined stress parameters for the components are met.

According to a second aspect of the present invention there is provided a system for prioritising event processing based on system workload, comprising: a rule generating interface including a time constraint setting component for defining a time constraint attribute in an event rule, wherein the event rule uses one or more events; a stress determining component for monitoring an event processing system to determine when the system is under a predefined level of stress; and a runtime component including a stress processing component for, if the system is determined to be under the predefined level of stress, establishing when the processing of a received event used in an event rule must be carried out using the time constraint attribute in the event rule.

The stress processing component for establishing when the processing of a received event used in an event rule must be carried out may include an urgent event component for processing the event immediately if the time constraint attribute indicates immediate action; or an event delay calculating component for processing the event after a predetermined amount of time as defined by the time constraint attribute.

The stress-processing component may include an event rule-checking component for calculating the maximum delay for an event based on the time constraints of one or more event rules in which the event is used; and an event-storing component for storing the event with a timer task for processing the event after the maximum delay.

The system may include an event retriever component for retrieving and processing a stored event after a given time delay.

The stress-determining component may be for determining that the system is no longer under the predefined level of stress; a stored event retriever component may be for processing any stored events in the order of their stored time delay.

The system may include a flag-setting component for setting a flag if the system is determined to be under a predefined

level of stress; and a flag-checking component for checking the flag when receiving an event at the event processing system.

The rule-generating interface may be a business user interface of an event processing system.

The stress-determining component for monitoring an event processing system may monitor components of the system and determine if predefined stress parameters for the components are met. The components of the system may include one or more of the group of a processor, a memory, an input queue.

According to a third aspect of the present invention there is provided a computer program product for prioritising event processing based on system workload, the computer program product comprising: a computer readable storage medium readable by a processing circuit and storing instructions for execution by the processing circuit for performing a method according to the first aspect of the present invention.

According to a fourth aspect of the present invention, there is provided a computer program stored on a computer readable medium and loadable into the internal memory of a digital computer, comprising software code portions, when said program is run on a computer, for performing the method of the first aspect of the present invention.

According to a fifth aspect of the present invention, there is provided a method substantially as described with reference to the figures.

According to a sixth aspect of the present invention, there is provided a system substantially as described with reference to the figures.

The described aspects of the invention provide the advantage of processing events for rules with urgent time scales in times of system stress whilst deferring less urgent events resulting in less workload on the system.

BRIEF DESCRIPTION OF THE DRAWINGS

The subject matter regarded as the invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. The invention, both as to organization and method of operation, together with objects, features, and advantages thereof, may best be understood by reference to the following detailed description when read with the accompanying drawings.

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the following drawings in which:

FIG. **1** is block diagram of an example embodiment of a system in accordance with the present invention;

FIG. **2** is a block diagram of an embodiment of a computer system in which the present invention may be implemented; and

FIG. **3** is a flow diagram of an example embodiment of an aspect of a method in accordance with the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

It will be appreciated that for simplicity and clarity of illustration, elements shown in the figures have not necessarily been drawn to scale. For example, the dimensions of some of the elements may be exaggerated relative to other elements for clarity. Further, where considered appropriate, reference numbers may be repeated among the figures to indicate corresponding or analogous features.

In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the invention. However, it will be understood by those skilled in the art that the present invention may be practiced without these specific details. In other instances, well-known methods, procedures, and components have not been described in detail so as not to obscure the present invention.

A method and a system are described for prioritising event processing based on the system workload at a given time. In the described method, when defining event processing logic, time constraints may be placed upon the rules for when they will be processed (for example, such as "within X hours", or "same day"). The event processing system may then use system statistics and metrics to determine when the system is under stress. If this is detected, then the method may use the time constraints to determine if the processing of each event can be delayed. If an event is eligible for delay it may be stored for later processing, if it is not then it may be processed immediately.

The main purpose of an event processing system is to look for patterns in the events being processed, and generate actions if patterns are matched. Two examples of event processing used by a bank are given below.

In the first example, the event processing is for fraud detection.

Events:
  Purchases
  Withdrawals
Actions:
  Possible Fraud
Event Rule logic:
  IF Purchase Event amount >1000
  AND
  Purchase Event type == 'internet'
  AND
  Purchase Event deliveryAddress != customer Address
  THEN
  Generate Possible Fraud Action

In the second example, the event processing is for marketing.

Events:
  Insurance quote on website
  Purchase Insurance Event
Actions:
  Sales agent follow up on quote
Event Rule logic:
  IF Insurance quote on website
  AND
  No Purchase Insurance Event within 1 day
  THEN
  Sales agent follow up on quote.

In looking at these two different applications of complex event processing, it is clear that the fraud detection logic is a much higher priority than the marketing. If a possible fraud has occurred, then an action should be generated as soon as possible, so that it can be investigated. However, the marketing action of following up on a quote, is much less important, as the actions from a previous day may just be picked up in the morning by a sales agent, and dealt with that day.

Typically, the event processing logic is defined by a business user using a business user interface. The described system may require an addition to this interface where the business user may specify time constraints on an event rule, to specify by when the logic needs to be evaluated.

In the runtime there may be provided a component that is responsible for determining if the system is under stress. This would typically look at CPU/memory utilisation, response times of event evaluation, and whether events are building up on the input queue. If "system under stress" (SUS) is detected then the component may set a flag that the runtime would query.

Referring to FIG. **1**, a block diagram shows an example embodiment of the described system **100**.

An event processing system **100** is described including a stress-determining component **101** for determining the stress on the event processing system **100** at a given time. The stress-determining component **101** may monitor components and operation of the event processing system **100** including a central processing unit (CPU) **111**, memory **112**, input queue **113**, and response time measuring component **114**.

The stress-determining component **101** may determine from the monitored components and operation if the event processing system **100** is under stress. Predefined parameters may be set to determine a level of stress. The stress-determining component **101** may include a flag-setting component **102** to set a flag showing that the system is under stress (SUS). The flag-setting component **102** may also remove the flag when the stress level of the event processing system **100** falls to acceptable levels, again according to predefined parameters.

The event processing system **100** may include a rule-generating interface **103** for defining event rules. The rule-generating interface **103** may include a time constraint-setting component **104** for a user to define a time constraint for a rule. For example, a time constraint may require a rule to be carried out within a set time from a relevant event being received, or may require it be carried out immediately. Event rules **105** may be stored including the defined time constraint **106**. If a user does not define a time constraint for a rule, a default may be set for carrying out the rule within a predefined time period.

The event processing system **100** may include a runtime component **110**. The runtime component **110** may include an event receiver component **121** for receiving events. Events may be generated by a wide range of components that may be remote to the event processing system. The runtime component **110** may process events according to defined event rules **105**.

The runtime component **110** may include a flag-checking component **122** to check if a stress flag has been set by the stress-determining component **101**. If no stress flag has been set, the received event may be sent for normal processing by a normal processing component **123** of the system.

However, if a stress flag has been set by the stress-determining component **101**, the received event may be sent to a stress-processing component **130** that processes events according to the time constraints defined in rules that apply to the received event. The stress-processing component **130** may include an event rule-checking component **131** for checking if the received event is used in any event rules **105** that have a time constraint **106** of immediate processing. If the event rule-checking component **131** identifies a received event that requires immediate processing, an urgent event component **132** may send the received event to the normal processing component **123** for immediate processing.

For any non-urgent received events, an event delay calculation component **133** may calculate the maximum delay possible or allowed for this event based on the time constraints in the rules it relates to identified by the event rule-checking component **131**. An event-storing component **134** may store the event **141** with its time delay **142** in event storage **140**. A timer component **135** may be set with the time delay **142** of a stored event **141** in order to enable an event retriever component **136** to retrieve the event at the end of a time delay **142** and send the event to the normal processing component **123**.

The flag-checking component **122** may continue to check the stress flag of the system **100** and, if it is identified that the flag has changed to a non-stress situation, a stored event retriever component **124** may retrieve stored events **141** from event storage **140** and may send the events to the normal processing component **123** for processing. This processing may be in the order of time of the stored events **141** time delay **142**.

Referring to FIG. **2**, an exemplary system for implementing aspects of the invention includes a data processing system **200** suitable for storing and/or executing program code including at least one processor **201** coupled directly or indirectly to memory elements through a bus system **203**. The memory elements may include local memory employed during actual execution of the program code, bulk storage, and cache memories that provide temporary storage of at least some program code in order to reduce the number of times code must be retrieved from bulk storage during execution.

The memory elements may include system memory **202** in the form of read only memory (ROM) **204** and random access memory (RAM) **205**. A basic input/output system (BIOS) **206** may be stored in ROM **204**. System software **207** may be stored in RAM **205** including operating system software **208**. Software applications **210** may also be stored in RAM **205**.

The system **200** may also include a primary storage means **211** such as a magnetic hard disk drive and secondary storage means **212** such as a magnetic disc drive and an optical disc drive. The drives and their associated computer-readable media provide non-volatile storage of computer-executable instructions, data structures, program modules and other data for the system **200**. Software applications may be stored on the primary and secondary storage means **211**, **212** as well as the system memory **202**.

The computing system **200** may operate in a networked environment using logical connections to one or more remote computers via a network adapter **216**.

Input/output devices **213** may be coupled to the system either directly or through intervening I/O controllers. A user may enter commands and information into the system **200** through input devices such as a keyboard, pointing device, or other input devices (for example, microphone, joy stick, game pad, satellite dish, scanner, or the like). Output devices may include speakers, printers, etc. A display device **214** is also connected to system bus **203** via an interface, such as video adapter **215**.

Referring to FIG. **3**, a flow diagram **300** shows an embodiment of the described method at a client system.

When each event is received **301** by the event processing system, the runtime may check if a stress flag is set for the system. It may be determined **302** if the stress flag is set. If there is no stress flag set, then the event may be processed immediately **304** as in normal operations.

If it is determined that the stress flag is set, it is determined **303** if the event is used by any rules which require immediate processing as indicated by a defined time constraint in the rule. If the event is used by a rule which requires immediate processing, the event may be processed immediately **304**.

If the event is not used by a rule that requires immediate processing, then the method may calculate **305** the maximum delay possible for this event. The maximum delay may be calculated in a few different ways. If the time constraint is along the lines of "must be processed within one hour", then calculating the delay is simple, it is just one hour from the current time. However, users may also wish to use time constraints such as "same day". In order to calculate the delay for this, a calculation may be made of how long there remains between the current time and midnight. Other examples of time constraints include "by 5 pm"—where the delay may be calculated in a similar way to the "same day" example.

The event and a timer task may be stored **306** that will fire at this time. The event may be stored in a persistent store such as a database, along with the time by which it should be processed.

The stress flag may be continually monitored and it may be determined **307** if the flag changes to a non-stressed state. If it is determined that the flag has changed to a non-stress state, the stored events may be processed **309** by a task that will query the database, and start processing the events that have been stored. The stored events may be processed in order of the time constraint indicating the time by which they need to be processed.

If it is determined **307** that the flag has not changed to a non-stress state and the system is therefore still in a stressed state, it may be determined **308** if the timer task has expired for a stored event. The process may read those events from the store on timer expiry, and they may be processed **309** in priority over events arriving newly in the system.

Traditional workload balancing systems work by prioritising work, and processing it in priority order, this can lead to an overall slowdown in processing, as there is a cost to managing these priorities, and response time will suffer as the system will be running at capacity whilst all requests are serviced.

The described method attaches a "must process by" attribute to an event (i.e., a request). This attribute may be used if the system is detected as being "under stress" and requests will not be processed until this time, or a time when the system is not under stress, thereby allowing more crucial events to be processed in a more timely manner.

In the described method, a business user may define the time by which an event should be processed, and this will then be automatically honored by the runtime. Normally changes to the priorities of requests would require some intervention by developers or system administrators.

As will be appreciated by one skilled in the art, aspects of the present invention may be embodied as a system, method or computer program product. Accordingly, aspects of the present invention may take the form of an entirely hardware embodiment, an entirely software embodiment (including firmware, resident software, micro-code, etc.) or an embodiment combining software and hardware aspects that may all generally be referred to herein as a "circuit," "module" or "system." Furthermore, aspects of the present invention may take the form of a computer program product embodied in one or more computer readable medium(s) having computer readable program code embodied thereon.

Any combination of one or more computer readable medium(s) may be utilized. The computer readable medium may be a computer readable signal medium or a computer readable storage medium. A computer readable storage medium may be, for example, but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, or device, or any suitable combination of the foregoing. More specific examples (a non-exhaustive list) of the computer readable storage medium would include the following: an electrical connection having one or more wires, a portable computer diskette, a hard disk, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, a portable compact disc read-only memory (CD-ROM), an optical storage device, a magnetic storage device, or any suitable combination of the foregoing. In the context of this document, a computer readable storage medium may be any tangible medium that can contain, or store a program for use by or in connection with an instruction execution system, apparatus, or device.

A computer readable signal medium may include a propagated data signal with computer readable program code embodied therein, for example, in baseband or as part of a carrier wave. Such a propagated signal may take any of a variety of forms, including, but not limited to, electro-magnetic, optical, or any suitable combination thereof. A computer readable signal medium may be any computer readable medium that is not a computer readable storage medium and that can communicate, propagate, or transport a program for use by or in connection with an instruction execution system, apparatus, or device.

Program code embodied on a computer readable medium may be transmitted using any appropriate medium, including but not limited to wireless, wireline, optical fiber cable, RF, etc., or any suitable combination of the foregoing.

Computer program code for carrying out operations for aspects of the present invention may be written in any combination of one or more programming languages, including an object oriented programming language such as Java, Smalltalk, C++ or the like and conventional procedural programming languages, such as the "C" programming language or similar programming languages. The program code may execute entirely on the user's computer, partly on the user's computer, as a stand-alone software package, partly on the user's computer and partly on a remote computer or entirely on the remote computer or server. In the latter scenario, the remote computer may be connected to the user's computer through any type of network, including a local area network (LAN) or a wide area network (WAN), or the connection may be made to an external computer (for example, through the Internet using an Internet Service Provider).

Aspects of the present invention are described above with reference to flowchart illustrations and/or block diagrams of methods, apparatus (systems) and computer program products according to embodiments of the invention. It will be understood that each block of the flowchart illustrations and/or block diagrams, and combinations of blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer program instructions.

These computer program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

These computer program instructions may also be stored in a computer readable medium that can direct a computer, other programmable data processing apparatus, or other devices to function in a particular manner, such that the instructions stored in the computer readable medium produce an article of manufacture including instructions which implement the function/act specified in the flowchart and/or block diagram block or blocks.

The computer program instructions may also be loaded onto a computer, other programmable data processing apparatus, or other devices to cause a series of operational steps to be performed on the computer, other programmable apparatus or other devices to produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide processes for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

The flowchart and block diagrams in the Figures illustrate the architecture, functionality, and operation of possible implementations of systems, methods and computer program

products according to various embodiments of the present invention. In this regard, each block in the flowchart or block diagrams may represent a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function(s). It should also be noted that, in some alternative implementations, the functions noted in the block may occur out of the order noted in the figures. For example, two blocks shown in succession may, in fact, be executed substantially concurrently, or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved. It will also be noted that each block of the block diagrams and/or flowchart illustration, and combinations of blocks in the block diagrams and/or flowchart illustration, can be implemented by special purpose hardware-based systems that perform the specified functions or acts, or combinations of special purpose hardware and computer instructions.

Improvements and modifications can be made to the foregoing without departing from the scope of the present invention.

The invention claimed is:

1. A computer-implemented method for prioritising event processing based on system workload, the computer-implemented method comprising:

defining a time constraint attribute in an event rule, wherein the event rule uses one or more events;

monitoring predetermined components and operation of an event processing system, including a central processing unit, a memory, an input queue, and a response time measuring component to determine whether the event processing system is not at one of acceptable predefined levels of stress according to a set of predefined parameters associated with the predetermined components used to determine a level of stress;

responsive to a determination that the event processing system is not at one of the acceptable predefined levels of stress, setting a stress flag;

establishing when processing of a received event used in the event rule is carried out using the time constraint attribute in the event rule by calculating a maximum delay for the received event using the time constraint attribute of the event rule in which the received event is used, when the received event is a non-urgent received event; and

storing, in event storage, the received event and an associated timer task for processing the received event on expiration of the maximum delay.

2. The computer-implemented method as claimed in claim **1**, wherein establishing when the processing of the received event used in the event rule is carried out comprises:

processing the received event immediately when the time constraint attribute indicates immediate action; and

processing the received event after a predetermined amount of time as defined by the time constraint attribute.

3. The computer-implemented method as claimed in claim **1**, wherein, after storing the received event, in the event storage, processing the received event after the maximum delay has priority over newly received events.

4. The computer-implemented method as claimed in claim **3**, further comprising:

responsive to a determination that the event processing system is at one of the acceptable predefined levels of stress, processing any stored events in an order of their stored time delay.

5. The computer-implemented method as claimed in claim **1**, further comprising:

checking the stress flag when receiving the received event at the event processing system.

6. The computer-implemented method as claimed in claim **1**, wherein defining the time constraint attribute in the event rule is defined in an option in a business user interface of the event processing system.

7. The computer-implemented method as claimed in claim **1**, wherein the monitoring the predetermined components and operation of the event processing system determines whether one or more of the set of predefined parameters associated with the predetermined components used to determine the level of stress are met.

8. The method as claimed in claim **1**,

wherein the event rule comprises event rule logic for processing events; and

wherein the event rule logic includes elements selected from a group consisting of an event type, an IF statement, and an AND statement.

9. A system for prioritising event processing based on system workload, the system comprising:

a processor;

a rule generating interface including a time constraint setting component for defining a time constraint attribute in an event rule, wherein the event rule uses one or more events;

a stress determining component for monitoring predetermined components and operation of an event processing system, including a central processing unit, a memory, an input queue, and a response time measuring component to determine whether the event processing system is a not at one of acceptable predefined levels of stress according to a set of predefined parameters associated with the predetermined components used to determine a level of stress; and

a runtime component including a stress processing component responsive to a determination that the event processing system is not at one of the acceptable predefined levels of stress, for setting a stress flag, establishing when processing of a received event used in the event rule is carried out using the time constraint attribute in the event rule by calculating a maximum delay for the received event using the time constraint attribute of the event rule in which the received event is used, when the received event is a non-urgent received event and storing, in event storage, the received event and an associated timer task for processing the received event on expiration of the maximum delay.

10. The system as claimed in claim **9**, wherein the stress processing component for establishing when processing of the received event used in the event rule is carried out further comprises:

an urgent event component for processing the received event immediately when the time constraint attribute indicates immediate action; and

an event delay calculating component for processing the received event after a predetermined amount of time as defined by the time constraint attribute.

11. The system as claimed in claim **9**, wherein the stress processing component further comprises:

an event rule checking component for calculating the maximum delay for the received event based on the time constraint attribute of the event rule in which the received event is used; and

an event storing component for storing, in the event storage, the received event and the associated timer task for processing the received event on the expiration of the maximum delay.

12. The system as claimed in claim 11, further comprising:

an event retriever component for retrieving and processing the received event after a given time delay after storing the received event in the event storage.

13. The system as claimed in claim 12, wherein in response to the stress determining component determining that the event processing system is at one of the acceptable predefined levels of stress,

the event retriever component processes each of the received events stored in the event storage in an order of a respective given time delay.

14. The system as claimed in claim 11, further comprising:

a stress flag setting component for setting a flag when the event processing system is determined not to be at one of the acceptable predefined levels of stress; and

a stress flag checking component for checking the flag when receiving the received event at the event processing system.

15. The system as claimed in claim 9, wherein the rule generating interface is a business user interface of the event processing system.

16. The system as claimed in claim 9, wherein the stress determining component for monitoring the predetermined components and operation of the event processing system determines whether one or more of the set of predefined parameters associated with the predetermined components used to determine the level of stress are met.

17. The system as claimed in claim 9, wherein components of the system further include one or more of a group comprising the processor, a memory, and an input queue.

18. A computer program product for prioritising event processing based on system workload, the computer program product comprising a computer readable storage medium storing instructions for execution by a processing circuit comprising:

instructions for defining a time constraint attribute in an event rule, wherein the event rule uses one or more events;

instructions for monitoring predetermined components and operation of an event processing system, including a central processing unit, a memory, an input queue, and a response time measuring component to determine whether the event processing system is not at one of acceptable predefined levels of stress according to a set of predefined parameters associated with the predetermined components used to determine a level of stress;

instructions, responsive to a determination that the event processing system is not at one of the acceptable predefined levels of stress, for setting a stress flag; and

instructions for establishing when processing of a received event used in the event rule is carried out using the time constraint attribute in the event rule further comprising instructions for calculating a maximum delay for the received event using the time constraint attribute of the event rule in which the received event is used, when the received event is a non-urgent received event and instructions for storing, in event storage, the received event and an associated timer task for processing the received event on expiration of the maximum delay.

19. The computer program product as claimed in claim 18, wherein the instructions for establishing when the processing of the received event used in the event rule is carried out further comprises:

instructions for processing the received event immediately when the time constraint attribute indicates immediate action; and

instructions for processing the received event after a predetermined amount of time as defined by the time constraint attribute.

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